

## Two New Species of *Austrophlebioides* Campbell and Suter (Ephemeroptera: Leptophlebiidae) from Australia, with Notes on the Genus

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**ABSTRACT** Two new species of *Austrophlebioides* Campbell and Suter, *A. marchanti* sp.nov. from Victoria, and *A. boofoumbi* sp.nov. from southeastern Queensland, are described, necessitating a slight modification to the generic definition. *A. decipiens* (Harker) comb.n. is transferred to *Austrophlebioides* from *Deleatidium*.

### Introduction

The genus *Austrophlebioides* was established by Campbell and Suter (1988) with *Austrophlebioides pusillus* (Harker) as the type species and *A. unguicularis* (Ulmer) as the only other species definitely included within the genus. In this study, two further species are described, one from Victoria and the second from southeastern Queensland. Incorporation of these species requires some modifications of the generic description. Material was prepared using the methods of Edmunds *et al.* (1976), illustrations were prepared using a drawing tube attached to a stereomicroscope or a microprojector. Morphological terms and conventions are consistent with those of Towns and Peters (1978). Measurements, in mm, are presented as averages with the range in parentheses. Type specimens are lodged at the Museum of Victoria (MV) and the Australian National Insect Collection (ANIC).

### *Austrophlebioides marchanti* sp.n. (Figs 1-21, 30-32)

**Types.** **Victoria:** Holotype ♂ imago, Loch River, Noojee, 37°48'40"S, 145°59'0"E, 9.i.1995, emerged in lab. 11.i.1995; allotype ♀ imago same locality, emerged in lab 2.v.1993; paratypes: 3 ♂♂, 3 ♀♀ imagines same locality, 15.i.1994; 3 ♀♀ imagines, 3 ♀♀ imagines, 3 ♀♀ subimago, 1 ♂ sub, same locality, 9.i.1995, emerged in lab. 13.i.1995; 3 nymphs same locality, 20.iii.1994, S. Parnrong (MV); 2 ♂♂ imagines, 2 ♀♀ imagines same locality, 15.i.1994; 2 nymphs same locality, 20.iii.1994, S. Parnrong (ANIC).

**Other material examined.** **Victoria:** 3 ♂♂ imagines Loch River, Noojee, 27.xi.1993; 1 ♀ imago same locality, 23.viii.1994; 1 ♀ subimago, Keppel Creek, 9.xii.1994; 4 nymphs Keppel Creek, 17.ix.1994; 1 ♂, 3 ♀♀ imagines Carey River, 37°32'8" S, 145°42'55"E, 24.xi.1993; 4 ♂♂ imagines Wellington River, 37°32'8"S, 145°43'10"E (MV).

**Male imago.** (in ethanol). Body length 8.3 (7.7-8.5). Fore wing length 8.6 (8.3-8.8), breadth 3.0 (2.9-3.1). Head reddish brown, carinae dark, antennae brown, eyes fused on meson of head, lower portion 0.65 length of upper portion, lower portion dark grey, upper portion brown, ocelli brown with black bases. Thorax reddish brown: pronotum with median carinae dark brown; mesonotum reddish brown; scutellum and

carinae dark brown; pleura dark brown with paler area; sterna reddish brown. Wings hyaline, veins brown, fore wing (Fig. 1) pterostigmal area lightly washed with very pale brown; 18-21 costal crossveins. Fore wing with Rs forked at 0.24 distance from base to margin; MA symmetrically forked at less than half distance (0.47) from base to margin, MP not forked, crossvein attaches MP<sub>2</sub> at base to CuA and MP<sub>1</sub>, attachment of MP<sub>2</sub> to MP<sub>1</sub> at ca 0.2 length of MP<sub>1</sub> and nearer to Rs fork than to wing base. Base of MP<sub>2</sub> closer to CuA than to MP<sub>1</sub>, ICu usually attached at base to CuA and CuP with crossveins but sometimes free, crossveins numerous in Cu area. Hind wing (Fig. 2) with costal margin concave slightly basal to midlength, apex acute, rounded, width 0.51 length, length 0.25 fore wing, Sc 0.95 wing length, crossveins numerous anterior to MP. Legs brown, forelegs darker with femora dark brown. Length ratio of fore leg 0.8 (0.71-0.9) : 1 (2.20-2.92) : 0.05 (0.03-0.05) : 0.5 (0.42-0.51) : 0.44 (0.37-0.49) : 0.41 (0.39-0.45) : 0.12 (0.11-0.13). Claws (Fig. 3) dissimilar, one of each pair apically hooked, one pad-like.

Abdomen (Fig. 4) reddish brown with median and lateral dark patterns; segments 9-10 and sometimes segment 8, distinctly darker than remainder. Genitalia (Figs 5-7) pale brown, forceps segments 2 and 3 subequal, each ca 0.2 of length of segment 1 which narrows quite abruptly at ca 0.4 length, tip of segment 3 rounded; styliger plate with shallow indentation. Penes fused for basal 0.53 of length (Fig. 5), but widely separated distally, a prominent dorsolateral lobe on each penis tipped with a small spine (Figs 6, 7) which is clearly visible extending through the transparent tissue of the lobe in whole mounts. Three caudal filaments present, terminal filament slightly longer than cerci.

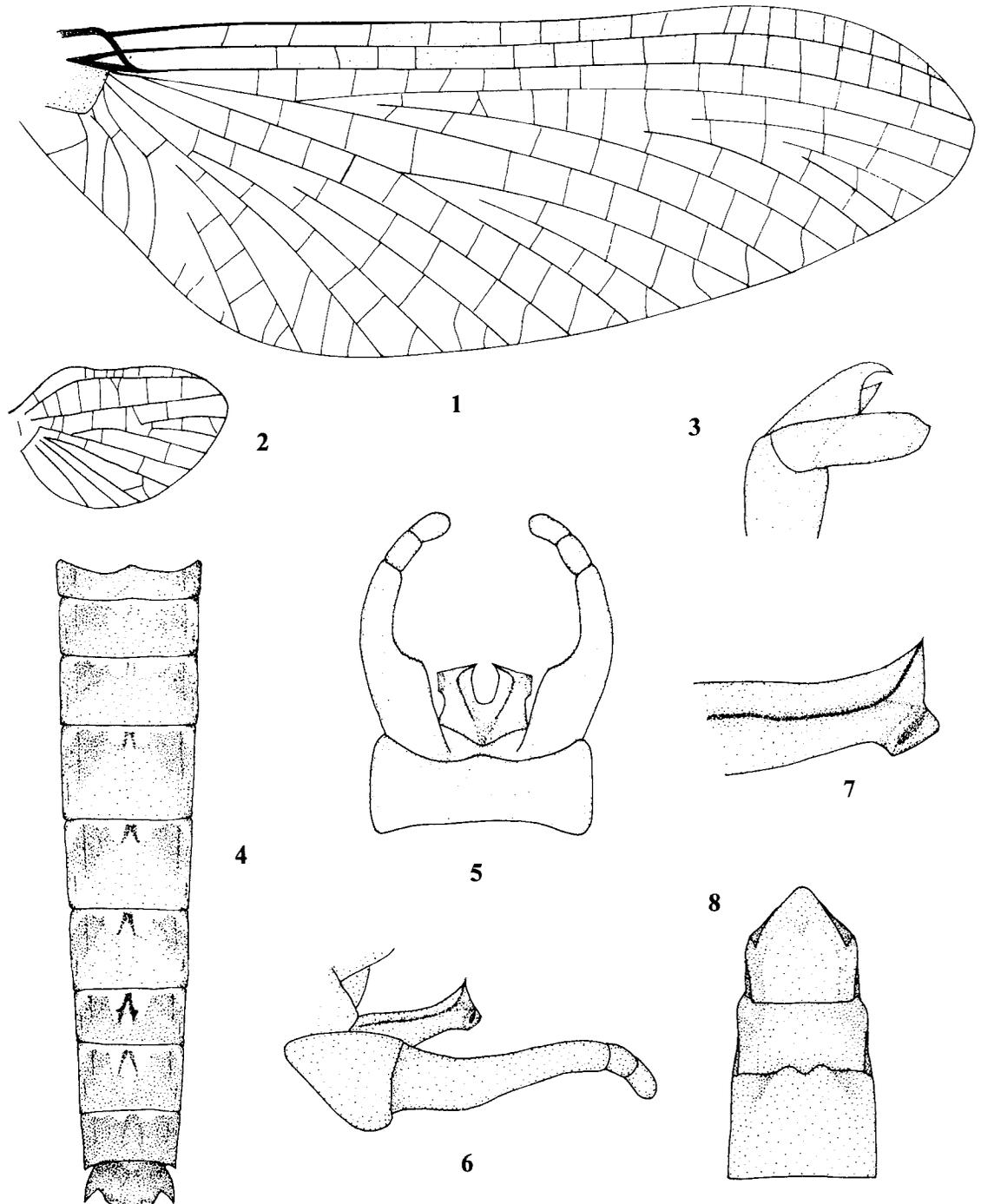
**Female imago** (in ethanol). Body length 7.7 (7.2-8.5). Fore wing length 8.9 (8.5-9.7), breadth 2.9 (2.3-3.3). As for male, except head reddish brown, eyes black, separated on meson of head by 2.5 times maximum width of eye, ocelli pale brown with black bases, antennae brown; thorax

and abdomen as for male but with sternum 9 rounded (Fig. 8).

**Male and female subimago** (in ethanol). Head as for imagos: thorax with carinae dark brown and black; wings light grey; abdomen uniform reddish

brown with more obvious median and lateral dark brown patches.

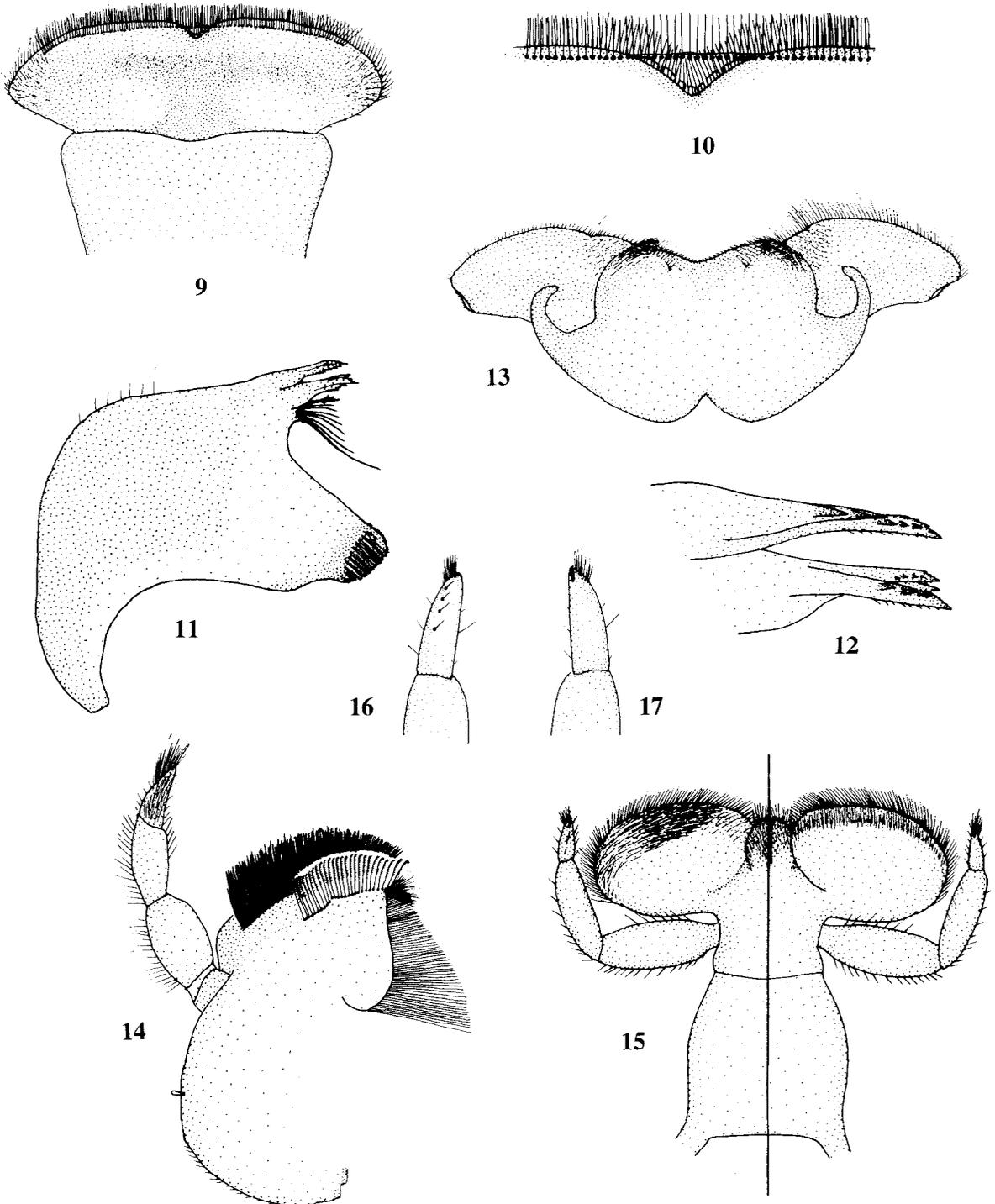
**Nymph** (in ethanol). Head prognathous, brown with lighter patches; antennae light brown *ca* twice head length, eyes black, ocelli grey with dark



**Figs 1-8.** *Austrophlebioides marchanti*, imago: (1) forewing; (2) hindwing; (3) tarsal claws; (4) dorsal abdominal pattern; (5) ♂ genitalia, ventral; (6) same, lateral; (7) detail of tip of penis; (8) ♀ abdominal sternite IX.

bases. Mouthparts (Figs 9-17): labrum (Figs 9, 10) length 0.32 breadth, dorsally 2 prominent subdistal even rows of hairs and submedian, anterosubmedian and anterolateral hairs ventrally; anteromedian emargination deep, narrow,

hooded, with a series of 7 small denticles; lateral margins rounded. Clypeus (Fig. 9) with sides diverging distally. Left mandible (Figs 11, 12), with marginal fine hair medially, incisors with serrated apical teeth (Fig. 12), prosthecal tuft well



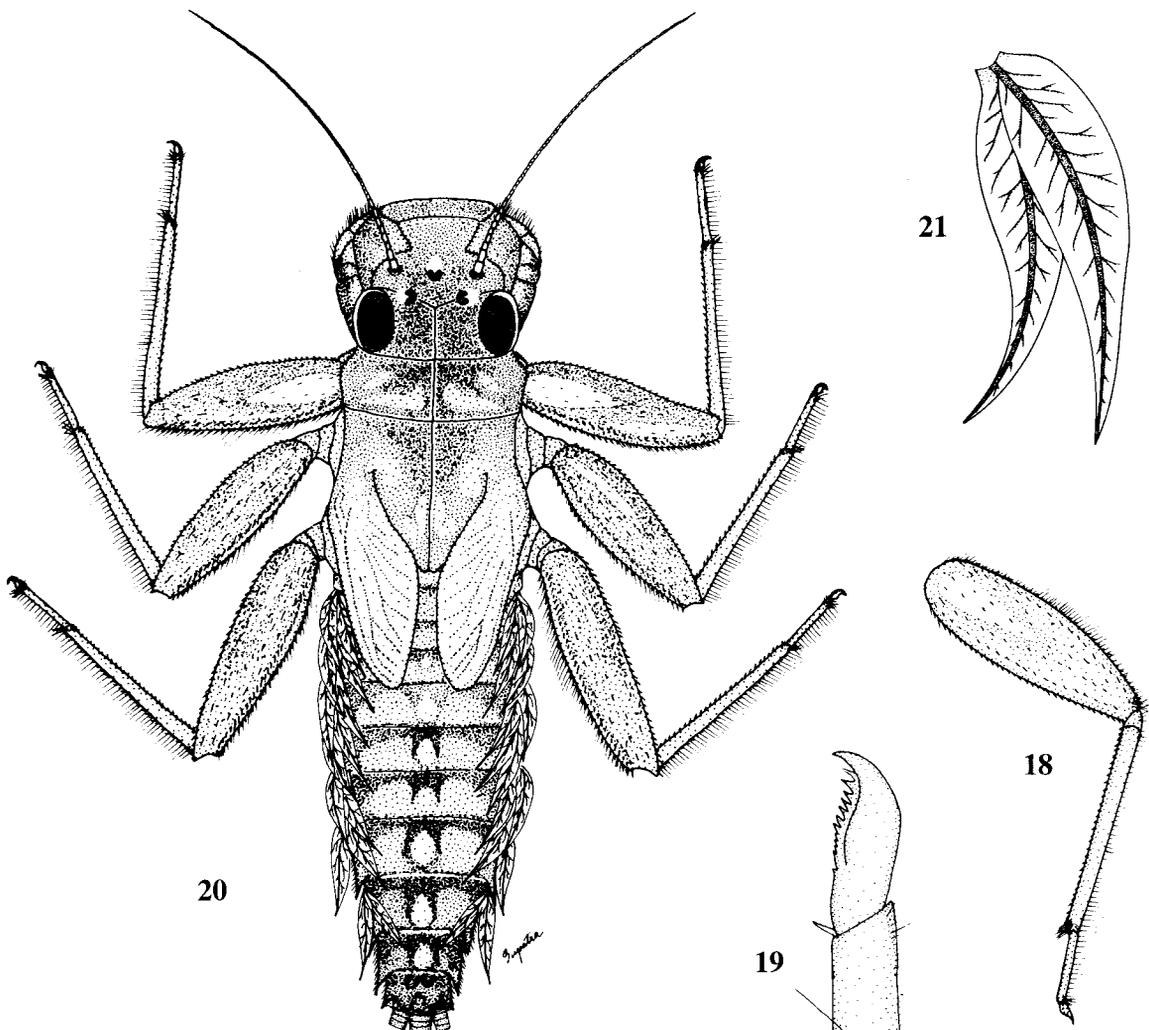
**Figs 9-17.** *Austrophlebioides marchanti*, nymph, mouthparts: (9) labrum, dorsal; (10) detail of labrum margin; (11) left mandible; (12) detail of incisors; (13) hypopharynx; (14) maxilla; (15) labium, dorsal view to left; (16) dorsal and (17) ventral detail of segment 3 of labial palps.

developed. Hypopharynx (Fig. 13) with lingua having well developed lateral processes, submedian lobes with a single row of long bristles anterolaterally; superlingua with dense hair row along anterior margin. Maxillae (Fig. 14) with apical half of galea-lacinia expanded medially with subapical row of 27 large spines, a small blunt spine (Figs 14, 30) on outer edge of galea-lacinia midway between palpi and base, palpi with segments 1 and 2 subequal, segment 3 *ca* 0.67 length of segment 2. Labium (Figs 15-17) with segments 1 and 2 of palpi subequal, segment 3 less than half length of segment 2 with a row of 4 large dorsal bristles and a row of finer lateral bristles subapically (Figs 16, 17); glossae slightly dorsal to paraglossae, submentum without spines on lateral margin. Pronotum dark brown with several minute spines on anterolateral margins. Thorax dark brown. Legs (Fig. 18) brown, all femora with numerous denticles and small spines and fine hair

fringe posteriorly, distinct elongate pale patches *ca* half femur length proximally which are particularly noticeable on the forelegs. Tibia with branched spines distally (Fig. 31). Inner surface of tarsi with a large spine and several small spines, apex of claw (Fig. 19) hooked and narrow with a row of denticles increasing in size distally.

Abdomen brown with distinct dark pattern (Fig. 20), pale brown ventrally, posterolateral spines on segments 2-9. Gills (Fig. 21) present on segments 1-7, lanceolate and progressively smaller posteriorly; dorsal and ventral lamellae similarly shaped. Tracheae with prominent central trunk and fine lateral branches. Terminal filament slightly longer than cerci, each segment with distal whorl of denticles.

**Egg.** Ovoid,  $140\ \mu\text{m} \times 70\ \mu\text{m}$ , chorionic pattern (Fig. 32) with rounded tubercles, and circular adhesion structures. Enlarged protuberant adhesion structures are most abundant in a band

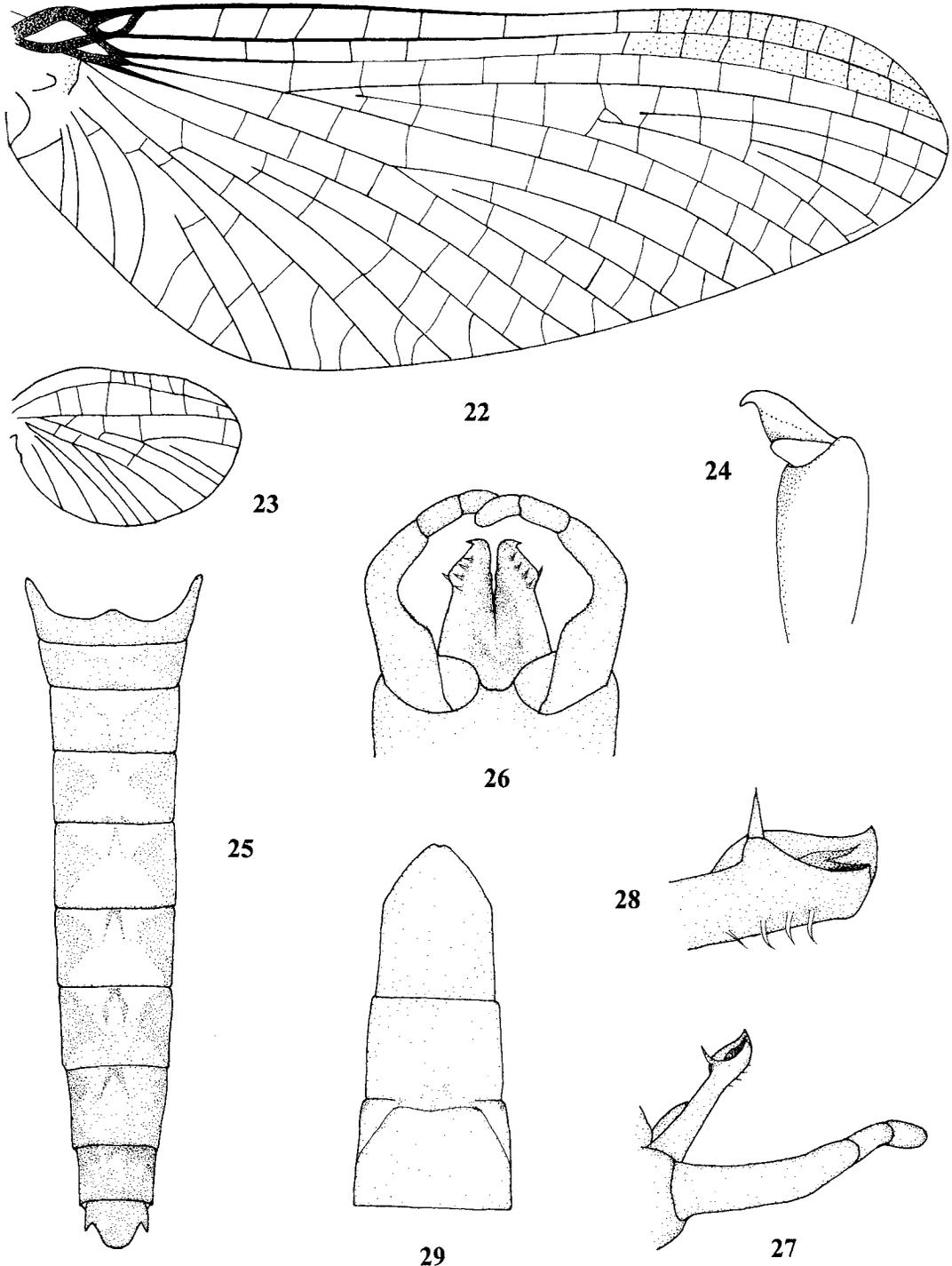


**Figs 18-21.** *Austrophlebioides marchanti*, nymph: (18) foreleg; (19) tarsal claw; (20) dorsal view of whole nymph; (21) abdominal gill.

around the midlength of the egg, several simple circular micropyles are present, each surrounded by a raised rim.

**Etymology.** The species is named for Dr Richard Marchant of the Museum of Victoria.

**Notes.** This species may be distinguished from all other species of *Austrophlebioides* by the following combination of characters in the male imago, penes fused about 0.5 length, with lobes widely separated distally and lacking small ventral



Figs 22-29. *Austrophlebioides booloumbi*, imago: (22) forewing; (23) hindwing; (24) tarsal claw; (25) dorsal abdominal pattern; (26) ♂ genitalia, ventral; (27) same, lateral; (28) detail of tip of penis; (29) ♀ abdominal sternite IX.

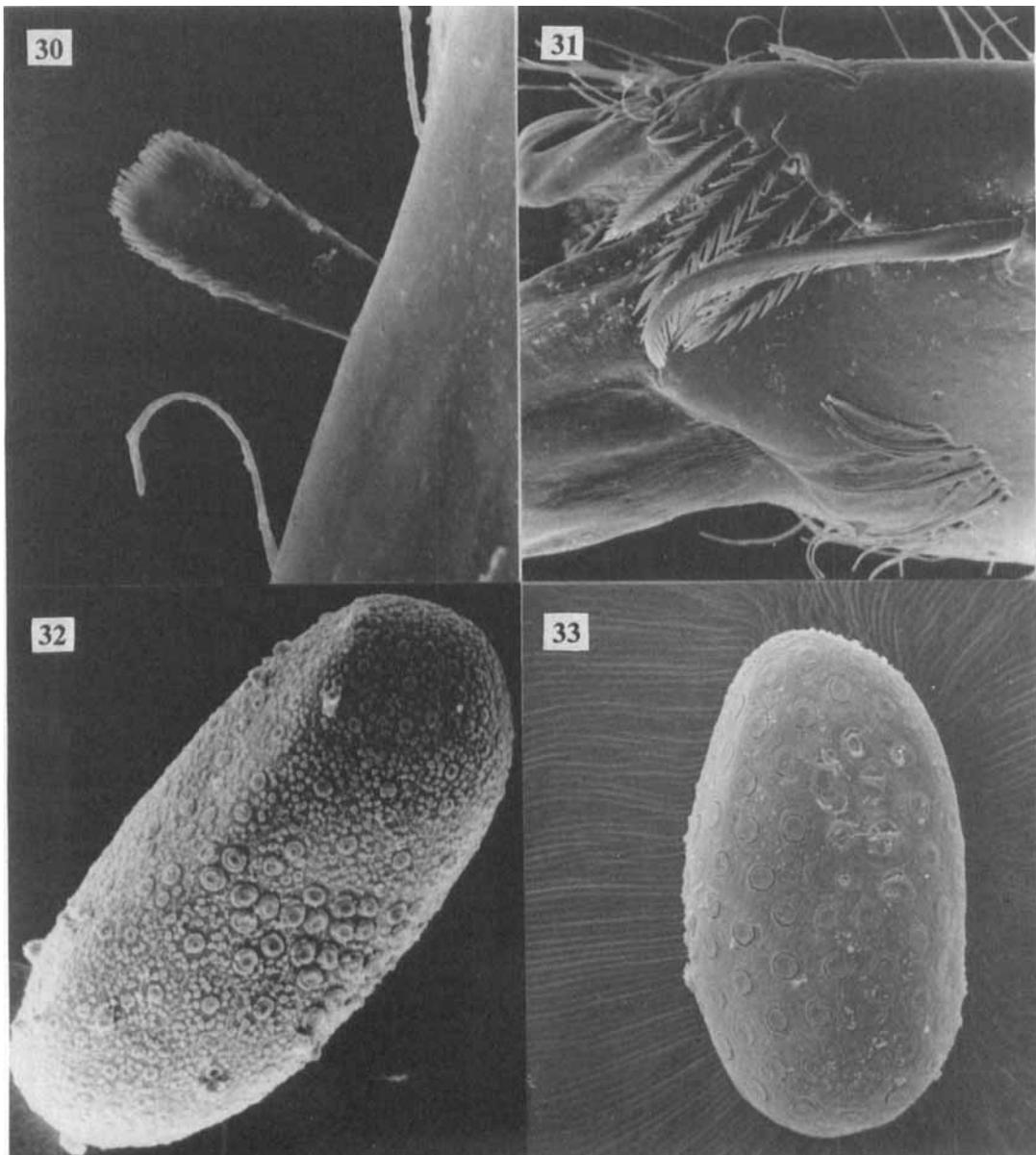
spines, in the nymph by the elongate pale patches on the femora and the small blunt spine on the outer margin of the maxilla basal to the palp.

*Austrophlebioides booloumbi* sp.n.  
(Figs 22-29, 33)

**Types. Queensland:** holotype ♂, Booloumba Creek, Connandale Ranges, Queensland, 26°42'45"S 152°37'16"E, 5.xii.89; Paratypes 10 ♂♂, 10 ♀♀, same location, same date, I. C. Campbell.

**Male imago** (in ethanol). Body length 9.3 (9.0-10.0). Fore wing length 9.3 (8.7-10.0), breadth

3.3 (3.2-3.6). Head brown, carinae dark, antennae light brown, eyes fused on meson of head, lower portion 0.72 length of upper portion, lower portion black, upper portion reddish brown, ocelli pale brown with black bases. Thorax brown: pronotum with median carinae brown; mesonotum brown, scutellum and carinae darker brown, pleura brown with paler patches, sterna brown. Wings hyaline, veins brown; fore wing (Fig. 22) pterostigmal area lightly washed, whitish; 17-21 costal crossveins. Fore wing with Rs forked at 0.22 distance from base to margin; MA



**Figs 30-33.** (30-32) SEM micrographs of *Austrophlebioides marchanti*: (30) spine on maxilla; (31) spines on tibia; (32) egg; (33) SEM micrograph of *A. booloumbi* egg.

symmetrically forked at 0.46 from base to margin; MP not forked, crossvein attaches MP<sub>2</sub> at base to CuA and MP<sub>1</sub>, attachment of MP<sub>2</sub> to MP<sub>1</sub> at 0.2 length of MP<sub>1</sub> and nearer to Rs fork than to wing base, base of MP<sub>2</sub> closer to CuA than to MP<sub>1</sub>, numerous crossveins in Cu area. Hind wing (Fig. 23) with costal margin concave, slightly basal to midlength, apex rounded, width 0.59 length, length 0.28 fore wing, Sc 0.95 wing length, CuA with at least 2 attached intercalaries, crossveins not numerous. Legs brown, 1st pair darker. Length ratio of fore leg 0.83 (0.82-0.83) : 1 (3.04-3.20) : 0.09 (0.08-0.09) : 0.50 (0.49-0.51) : 0.44 (0.43-0.44) : 0.31 (0.28-0.33) : 0.11 (0.10-0.11). Claws (Fig. 24) dissimilar, one of each pair apically hooked, one pad-like.

Abdomen (Fig. 25) pale brown with median and lateral dark patterns, segments 9, 10 and sometimes 8 darker than remainder which often appear transparent. Genitalia (Figs 26-28) brown, forceps segments 2, 3 subequal, each *ca* 0.28 of length of segment 1 which narrows quite abruptly at *ca* 0.44 length, tip of segment 3 rounded; styliger plate with deep indentation. Penes fused 0.63 length (Fig. 26), bluntly rounded distally with a very large (*ca* the width of each lobe) prominent dorsolateral spine curving posteriorly on each lobe at about 0.7 length, a series of 4 fine ventral spines, one basal and the rest distal to the dorsolateral spine (Figs 27, 28). Three caudal filaments present.

**Female imago** (in ethanol). Body length 9.1 (8.5-9.5). Fore wing length 10.7 (10.4-10.9), breadth 3.6 (3.4-3.8). As for male, except eyes separated on meson of head by 2.5 times maximum width of eye; thorax and abdomen as for male but sternum 9 (Fig. 29) rounded with shallow cleft.

**Nymph.** Unknown.

**Egg.** Ovoid, 130 µm × 80 µm, chorionic pattern (Fig. 33) with rounded tubercles, circular adhesion structures inside, simple circular micropyles. The eggs appeared to be very similar to those of *A. pusillus*.

**Etymology.** The species is named for the type locality.

**Notes.** This species can be distinguished from all other species of *Austrophlebioides* by the following combination of characters: in the male imago, penes bluntly rounded distally rising to a hook-like tip in lateral view and with a large dorsolateral spine curving posteriorly on each lobe, and a series of ventral spines, one basal and the others distal to the dorsolateral spine. In the hindwing 1 CuA with at least 2 attached intercalaries. The species can be distinguished from *A. unguicularis* by its larger size (wing length 8.5-10 mm *cf* *A. unguicularis* 6-7 mm), the blunt rounded form of the penis tip and the posterior

curvature of the large lateral spine on the penis (*vs* anterior curvature for *A. unguicularis*). The location of the ventral spines also appears to be more posterior in *A. unguicularis*. In the hindwing the costal margin appears to be more deeply indented in *A. unguicularis*, and there are no intercalaries attached to CuA.

*A. booloumbi* differs from *A. pusillus* in the following combination of characters: abdominal terga IX and X evenly pigmented with only a faint pattern, penis in lateral view bluntly rounded terminally rather than drawn out to an acute tip, first segment of forceps with distal portion sharply angled inwards rather than gently curved, hind wing rounded distally rather than acute, and with two intercalaries attached to CuA rather than detached.

### Discussion

*Austrophlebioides* Campbell and Suter was described to include the species *A. pusillus* (Harker) and *A. unguicularis* (Ulmer). It is clear from the literature that *Deleatidium decipiens* Harker should also be included in the genus *Austrophlebioides* based on the distinctive morphology of the genitalia, and we thus formally transfer it. The description of *A. marchanti* in the genus requires some modifications of the generic diagnosis. The series of fine ventral spines present on the penes, noted as a generic characteristic in the original description of *Austrophlebioides* is absent in *A. marchanti*, and we consider it to be a specific rather than a generic characteristic. In addition the fore wings of some specimens of both *A. marchanti* and *A. booloumbi* have vein ICu detached from the crossvein which attaches CuA to CuP in contrast to the original generic diagnosis.

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